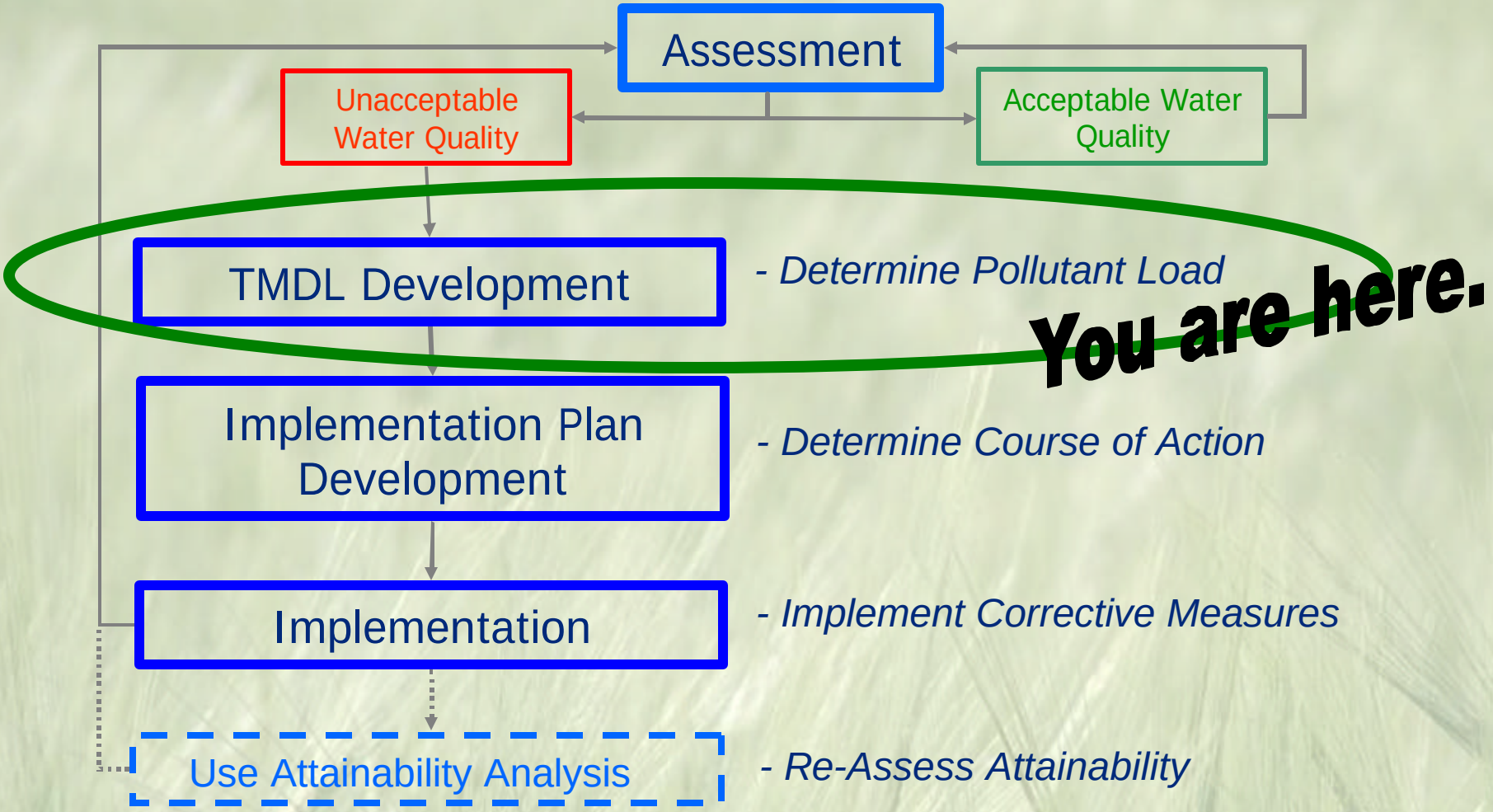
Blackwater River and Tributaries *E. coli* TMDL Development and Source Assessment

Blackwater River, Blackwater Swamp, Warwick Swamp, Second Swamp, Otterdam Swamp, UT Coppahaunk Swamp

First Public Meeting

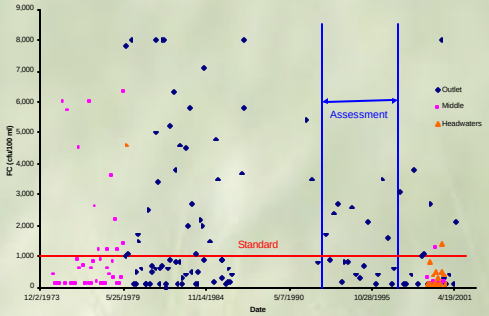
December 3, 2008

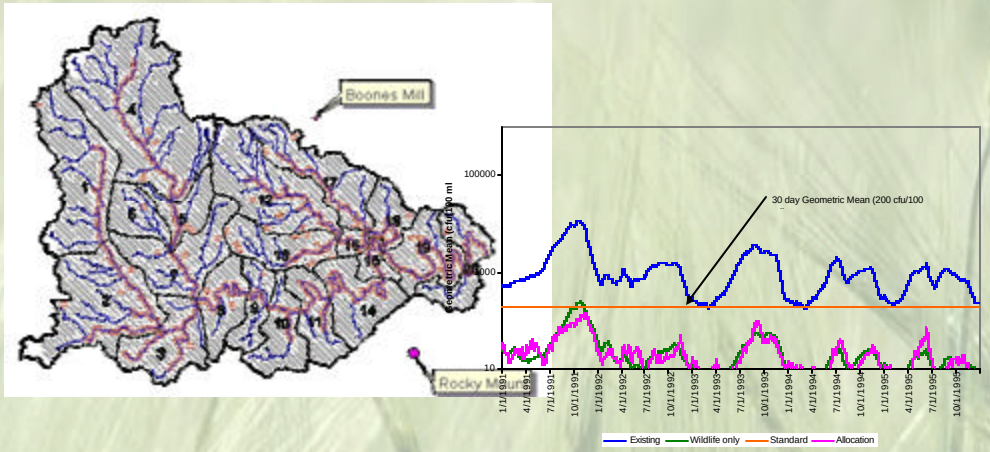
TMDL Process



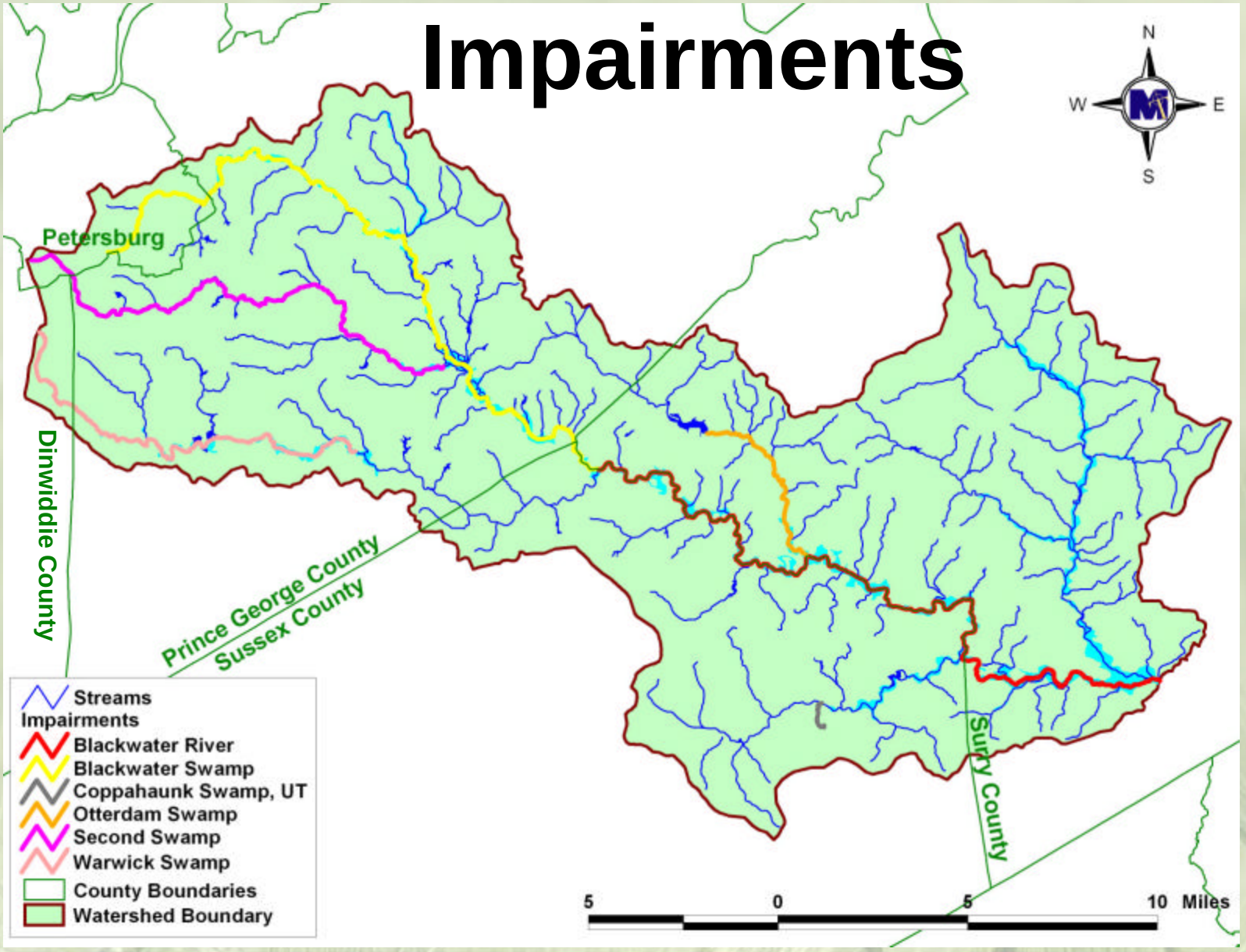
Major Components of the TMDL Report Development

- Source Assessment
- Modeling
  - Hydrology
  - Water Quality
  - Load Allocation
- Public Participation

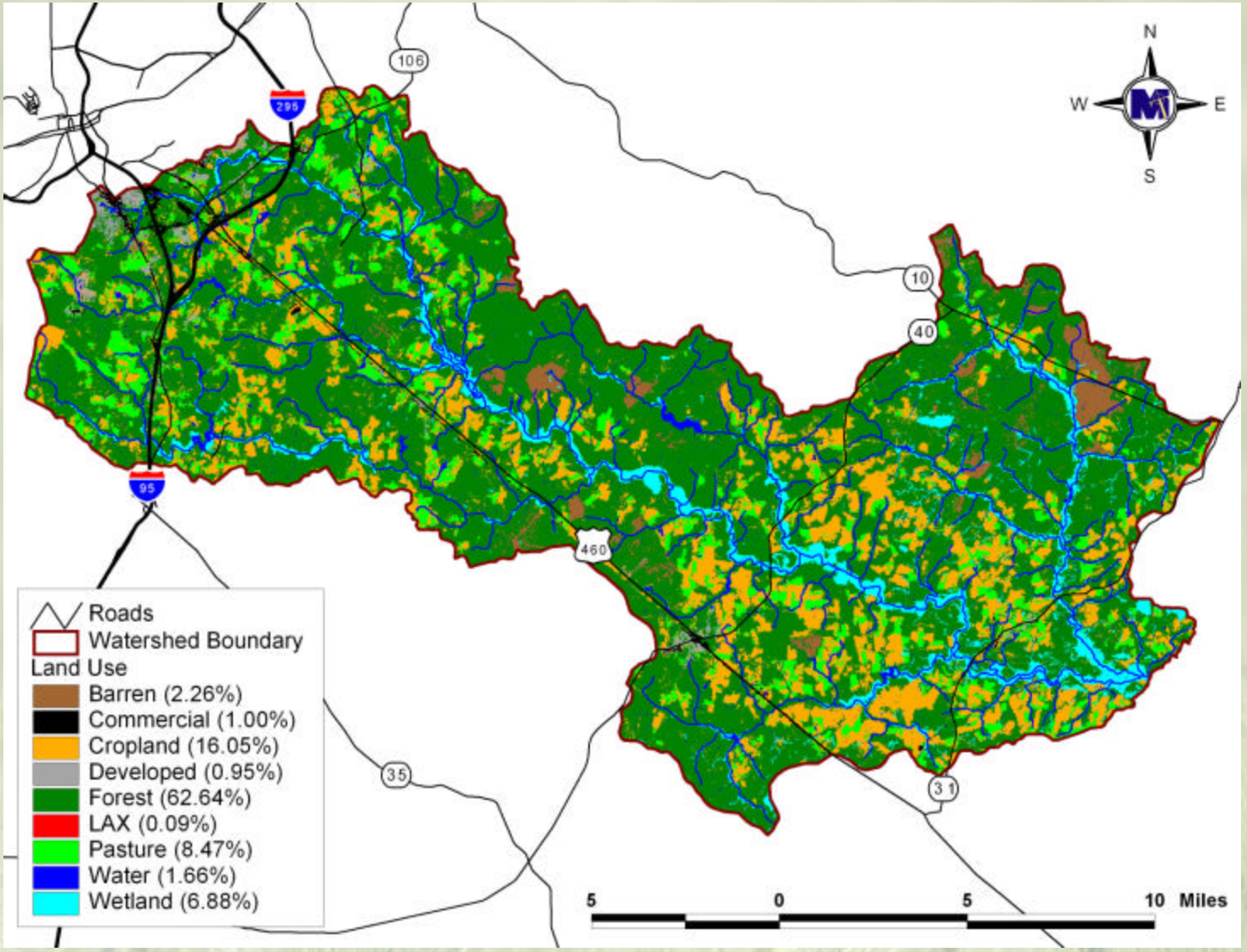




Impairments



Blackwater River Watershed Land Use



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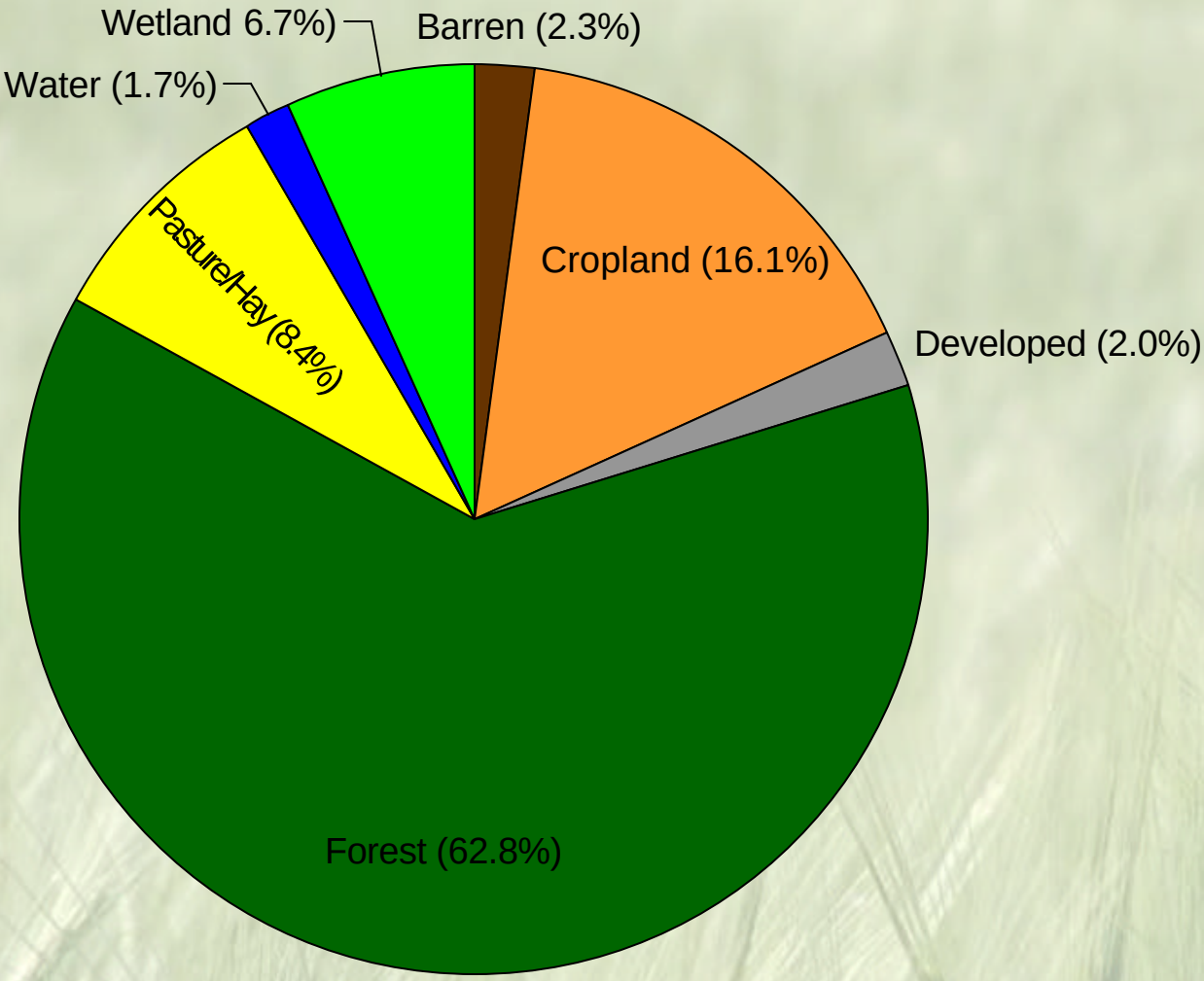
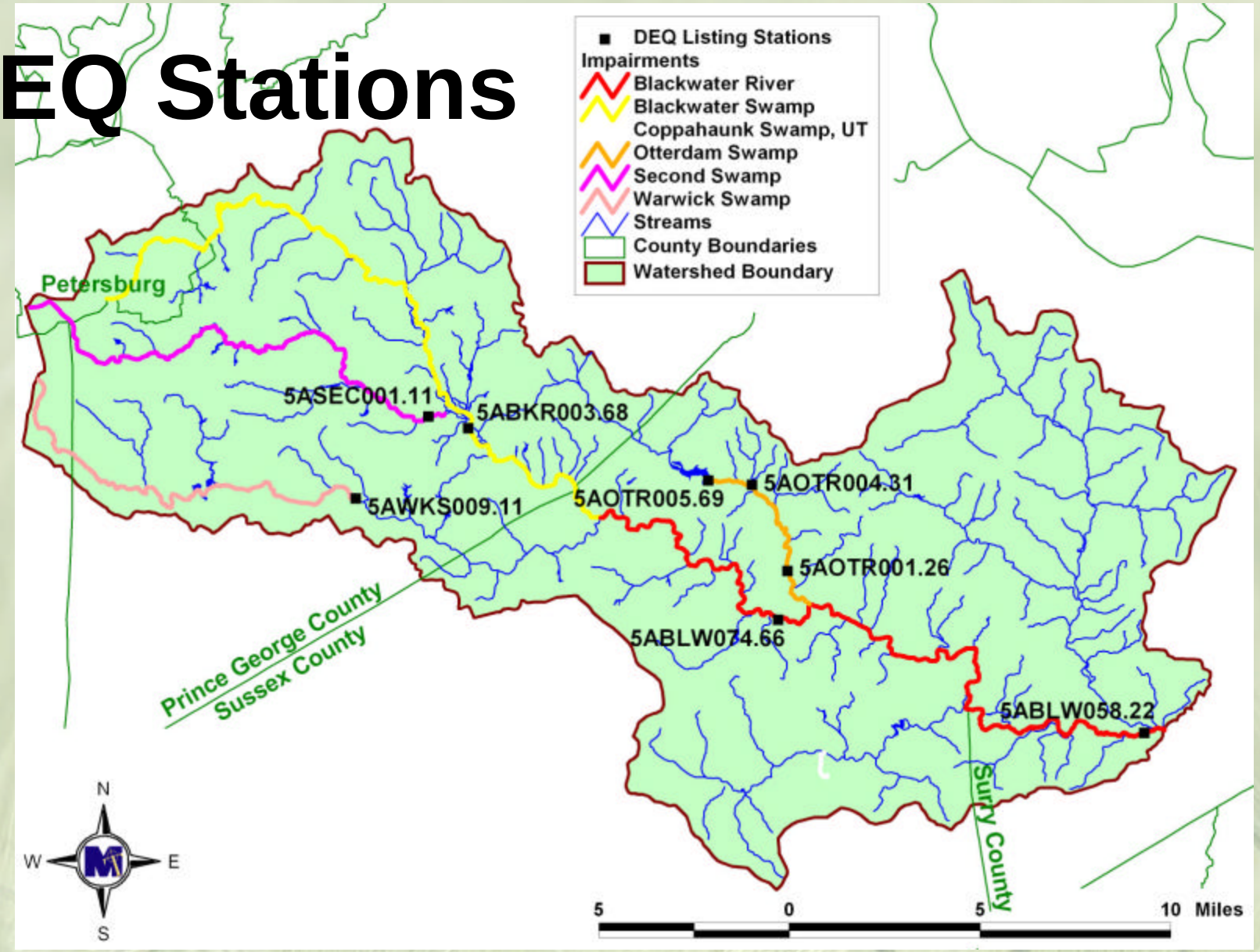


DEQ Stations



DEQ *E. coli* Data

Stream	Station	Date Range	Count	Minimum	Maximum	Mean	Violation %
Blackwater Swamp	5ABKR001.92	1/08 - 12/08	12	100	300	133	8.3%
Blackwater Swamp	**5ABKR003.68**	8/03 - 12/08	21	25	1,400	234	19.0%
Blackwater Swamp	5ABKR014.01	1/08 - 12/08	12	100	900	167	8.3%
Blackwater Swamp	5ABKR016.95	1/08 - 12/08	12	100	300	183	33.3%
Blackwater River	**5ABLW058.22**	8/03 - 3/09	41	16	1,300	182	19.5%
Blackwater River	**5ABLW074.66**	8/03 - 3/09	40	15	2,000	222	17.5%
Blackwater River	5ABLW087.70	1/08 - 12/08	12	100	500	158	16.7%
North Fork Blackwater Swamp	5ABNF000.65	1/08 - 12/08	12	100	400	167	16.7%
Johnchcohunk Swamp	5AJCH002.27	7/03 - 12/08	23	20	400	143	17.4%
Otterdam Swamp	**5AOTR001.26**	5/05 - 12/08	19	25	1,800	346	26.3%
Otterdam Swamp	**5AOTR004.31**	6/04 - 12/08	14	100	800	228	21.4%
Otterdam Swamp	**5AOTR005.69**	1/08 - 12/08	12	100	100	100	0.0%
Second Swamp	**5ASEC001.11**	1/08 - 12/08	11	100	600	155	9.1%
Second Swamp	5ASEC005.39	1/08 - 12/08	12	100	1,700	242	8.3%
Second Swamp	5ASEC008.74	1/08 - 12/08	12	100	900	192	16.7%
Second Swamp	5ASEC010.97	1/08 - 12/08	12	100	200	108	0.0%
Second Swamp	5ASEC012.54	1/08 - 12/08	12	100	100	100	0.0%
Second Swamp	5ASEC014.08	1/08 - 12/08	12	100	8,000	983	16.7%
Warwick Swamp	5AWKS001.00	2/07 - 12/08	18	17	400	139	16.7%
Warwick Swamp	5AWKS002.12	1/08 - 12/08	12	100	3,900	483	33.3%
Warwick Swamp	5AWKS003.66	1/08 - 12/08	12	100	600	158	8.3%
Warwick Swamp	5AWKS006.46	1/08 - 12/08	12	100	200	117	0.0%
Warwick Swamp	**5AWKS009.11**	5/05 - 12/08	19	10	770	233	31.6%
Warwick Swamp	5AWKS013.53	1/08 - 12/08	12	100	100	100	0.0%
Warwick Swamp	5AWKS016.48	1/08 - 12/08	12	100	1,800	275	16.7%
UT to UT to Warwick Swamp	5AXHO000.46	1/08 - 12/08	12	100	3,500	442	25.0%

Bacterial Source Assessment

- Permitted discharges
  - Wastewater treatment facilities
  - Other Permitted Discharges
- Human
  - Biosolids
  - Failed Septic Systems
  - Straight Pipes
- Pets
- Livestock
- Wildlife

[Human + Pet + Livestock = Controllable Loading]

Permits in the Study Area (2009)

- 2 Permitted Discharges both permitted for control of fecal bacteria
- 4 General Permits for single family homes
- 6 Hog Confined Animal Feeding Operations (CAFOs)

Human Source

Population, housing units, and onsite treatment system based on U.S. Census

- Failing or Improperly Functioning Septic Systems
  - Effluent reaching ground surface throughout the year
  - Lateral movement continuously to stream
- Straight Pipes
  - Direct continuous input into stream
- Biosolids
  - Land-applied

Human Population (2009)

Impairment	Population	Housing Units	Housing Units with Sewer	Housing Units with Septic	Housing Units with "Other"	Housing Units with Failing Septic
Blackwater Swamp	11,155	4,758	3,554	1,152	52	920
Second Swamp	4,227	1,726	387	1,310	29	197
Warwick Swamp	2,077	815	30	772	13	89
Otterdam Swamp	195	87	3	73	11	9
UT Coppahaunk Swamp	15	8	6	2	1	1
Blackwater River	23,426	9,897	5,215	4,462	221	1,483
Project Watershed Total	23,426	9,897	5,215	4,462	221	1,483

Pet Source (2009)

- Population/household based on literature values, veterinarians, and animal control
- Translated to housing units based on U.S. Census
- Land-applied

Pet Populations (2009)

Impairment	Dogs	Cats
Blackwater Swamp	2,386	2,671
Second Swamp	864	968
Warwick Swamp	421	471
Otterdam Swamp	42	47
UT Coppahaunk Swamp	4	4
Blackwater River	4,923	5,513
Project Watershed Total	4,923	5,513

Livestock Source

- Population
  - Virginia Agricultural Statistics
- Distribution of waste
  - Pastured
  - Confined, waste collected, spread
  - Direct deposition to the stream
- Seasonal varying applications

Livestock Populations (2009)

Impairment	Horse	Dairy Milker	Dairy Dry	Dairy Calf	Beef Stocker	Beef Calf	Sheep	Hog
Blackwater Swamp	90	21	10	10	173	171	24	0
Otterdam Swamp	16	4	2	2	18	14	4	50,495
Second Swamp	51	11	5	5	104	96	12	0
UT Copphaunk Swamp	3	1	0	0	6	4	1	9,000
Warwick Swamp	91	11	4	4	97	87	12	0
Blackwater River	471	98	41	41	725	618	107	59,495
Project Watershed Total	471	98	41	41	725	618	107	59,495

Wildlife Source

- Population
  - Animal densities from VDGIF biologists
  - Habitat from literature values
- Distribution of waste based on habitat
  - Land-applied
  - Direct deposition to the stream
- Seasonal variations based on migration patterns and food sources

Wildlife Populations

Impairment	Deer	Turkey	Beaver	Raccoon	Muskrat	Duck	Goose
Blackwater Swamp	1,175	289	264	2,474	1,479	31	15
Second Swamp	561	141	290	1,168	735	15	8
Warwick Swamp	477	124	351	996	649	14	7
Otterdam Swamp	274	72	201	566	286	6	3
UT Coppahaunk Swamp	23	6	489	47	2	0	0
Blackwater River	6,174	1,589	3,148	12,938	7,117	148	73
Project Watershed Total	6,174	1,589	3,148	12,938	7,117	148	73

How do we determine the TMDLs?

+ Watershed data

TMDL

Hydrologic Modeling Components

- Climatic data
- Land use
- Topography
- Soils
- Stream channel characteristics
- Point source discharge/withdrawal
- Flow data

Water Quality Modeling Components

- Sources
  - –Fecal production
  - –FC densities
  - –FC distribution
- Delivery Mechanisms
  - –Direct
  - –Land-applied
- Temporal Variation

Modeling

- Public Meeting 2 (early winter 2010)
- Public Review
- Submit to EPA
- State Approval
- Implementation Plan Development
- Implementation

Contact Information

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